REMARKS

INTRODUCTION

Claims 1, 2, 5, 6, 8 and 9 were previously and are currently pending and under consideration.

Claim 10 is added herein.

Claims 1, 2, 5, 6 and 8-10 are now pending.

Claims 1, 2, 5, 6, 8 and 9 are rejected.

Claim 1 is amended herein.

No new matter is being presented, and approval and entry are respectfully requested.

In view of the numerous pending issues, and in view of the number of bases for traversing the prior art rejections, Applicant respectfully notes that "[w]here the applicant traverses any rejection, the examiner should, if he or she repeats the rejection, take note of the applicant's argument and answer the substance of it" (MPEP § 707.07(f)). Furthermore, MPEP § 706.07 states that "[t]he applicant ... should receive the cooperation of the examiner to that end, and not be prematurely cut off in the prosecution of his or her application. ... a clear issue between applicant and examiner should be developed, if possible, before appeal." MPEP § 707.07(f) states that although an "[a]pplicant 's arguments with respect to [claims] have been considered ... moot in view of the new ground(s) of rejection ... "[t]he examiner must, however, address any arguments presented by the applicant which are still relevant to any references being applied."

OBJECTIONS TO THE DRAWINGS

In the Office Action, at page 2, the drawings were objected to. In particular, the drawings were objected to for not showing the "segment" recited in claims and 6 and 8. The objection is traversed because, as discussed below, the figures do show such a segment.

Claim 6 for example recites "accelerations of at least a segment of the speed-to-acceleration mapping coincide with, or approximate, or are based on accelerations of a corresponding segment of a restricted acceleration mapping of the axis". Although the rejection

refers only to "the segment", there are two segments recited in claim 6. Applicant will explain how both segments are shown in the current drawings. The first "segment" is a segment with accelerations that approximate etc. accelerations of a corresponding segment of a restricted acceleration mapping. Figure 3 shows a "restricted acceleration curve" (in the right hand graph, the curve going from the arrowhead of the acceleration axis to the arrowhead of the speed axis). Figure 3 also shows an "actual acceleration curve". The area of the right hand graph between the two dotted lines is an area where the actual acceleration curve and the restricted acceleration curve overlap. This depicts a segment of each curve, where, in view of the overlap, the actual acceleration curve overlap segment is a segment that corresponds to, is based on, or approximates the restricted acceleration curve. The segments' overlap, as shown, can also extend below the lower dotted line; the claims are not limited to a particular segment.

Reconsideration and withdrawal of the outstanding objection to the drawings is respectfully requested.

REJECTIONS UNDER 35 USC § 112, FIRST PARAGRAPH

In the Office Action, at pages 2-3, claims 6 and 8 were rejected under 35 U.S.C. § 112, first paragraph, for the reasons set forth therein. The Office alleged that the claim recitation "segment" is not supported by the specification.

It is respectfully submitted that the specification does support "segment". See the traversal of the objection to the drawings. At page 4, the specification states that "acceleration and deceleration control is performed in which an actual acceleration curve lies along a restricted acceleration curve as much as possible". Page 5 states that "the speed-acceleration curve is set such that it agrees with or is approximate to the restricted acceleration curve".

Claim 6 was rejected because it recites a "mapping". According to the Merriam-Webster Online Dictionary, to "map" can be "to assign (as a set or element) in a mathematical correspondence <map a set onto itself> <map picture elements to video memory>". The same dictionary indicates that a "mapping" can be a "function". In sum, a "mapping" is simply a mathematical correspondence between two sets. As discussed above, the specification supports the idea of a correspondence between a restricted acceleration curve segment and a speed-acceleration curve segment.

Withdrawal of the rejection is respectfully requested.

REJECTIONS UNDER 35 USC § 112, SECOND PARAGRAPH

In the Office Action, at page 3, claim 1 was rejected under 35 U.S.C. § 112, second paragraph, for the reasons set forth therein. The rejected portion of claim 1 has been reworded for improved clarity. Withdrawal of the rejection is respectfully requested.

REJECTIONS UNDER 35 USC §§ 102 AND 103

In the Office Action, at page 4, claim 5 was rejected under 35 U.S.C. § 102 as anticipated by Boyer. In the Office Action, at pages 4-6, claims 1, 2, 6, 8 and 9 were rejected under 35 U.S.C. § 103 as being unpatentable over Boyer in view of Kato. These rejections are traversed and reconsideration is requested.

These rejections are traversed and reconsideration and withdrawal is requested.

PRIOR ART: BOYER AND KATO

Boyer discusses a system for functionally calculating a path plan. Boyer addresses problems, such as wear and tear (column 2, lines 7-9) caused by constant velocity, by calculating a motion profile that eliminates constant velocity (column 1, lines 52-67). An operator inputs data corresponding to moves in the cycle of a multiaxis machine. A controller controls the motors of the machine in accordance with positions set forth in a path planning table. The path planning table is generated by the controller by applying a curve-defining equation. Variables of the equation are adjusted based on testing of an initial version of the path plan. (Column 2, lines 21-35). The path planning table 40 is generated "by applying a curve defining equation and integrating the alpha and beta variables into the curve defining equation" (column 5, lines 27-29). Optimal variables are determined through a repeated sequence of measurement and analysis, however, there is no explanation of precisely how a modification is "deemed advantageous to improve performance" (column 5, lines and 48-50).

Kato discusses determining a maximum acceleration (constant value) by taking an acceleration profile into consideration but without matching or approximating that curve over a segment or portion. As discussed in detail below with reference to the claims, Kato does not

disclose obtaining accelerations for each acceleration/deceleration cycle.

MISCELLANEOUS AMENDMENT FOR CLARITY

Before addressing the prior art rejections, a minor change to the claims is explained. The recitation "restricted acceleration curve" has been changed two its substantial equivalent; "predetermined speed-acceleration curve". A "restricted acceleration curve" is a curve physically restricted or constrained depending upon characteristics of a motor, moving direction and acceleration/deceleration. A "predetermined speed-acceleration curve" is a curve in which the above-mentioned "restricted acceleration curve" is set in parameters as actual set values. These two curves are substantially the same. Because the term "predetermined speed-acceleration curve" is used in the first half of claim 1 (lines 7 to 8), the term "restricted acceleration curve" is not necessary in the later half of claim 1.

Furthermore, the expression "corresponding plural predetermined accelerations... of the speed-acceleration curve are based on, or equal to, or approximation of corresponding plural accelerations... of a restricted acceleration curve" in previously pending claim 1 has been rewarded. Properly speaking, an acceleration is determined such that "(actual) speed-acceleration curve" is based on, or equal to, or approximation of "the predetermined speed-acceleration curve". Although claim 1 was previously patentable, claim 1 is amended herein in view of this improved understanding.

NEITHER BOYER NOR KATO DISCLOSE ACCELERATIONS APPROXIMATING, BASED ON, OR CORRESPONDING TO A SPEED-ACCELERTION CURVE

A speed-acceleration curve has been discussed previously and is also discussed in the next section. As discussed above, Boyer explicitly uses a function to calculate an optimized path plan that has no constant velocity. The rejection states that Boyer teaches acceleration restrictions at column 6, lines 27-29. The cited portion of Boyer relates to a "maximum acceleration". The maximum acceleration or "SMAX", is "ultimately ... the single maximum rate of speed for all moves of a path for as many axes as the program 42 executes". (Column 6, lines 34-36). It appears that the SMAX variable is a temporary variable that is assigned to the "Acc" variable and is used so that the acceleration at any given move can be checked against the maximum acceleration of all moves. Furthermore, the "maximum acceleration" is not the same as a restricted acceleration. The maximum acceleration is simply a theoretical acceleration based on displacement, a time span for the displacement, and a normalized peak

acceleration limit (column 6, line 29). Boyer does not describe the normalized peak acceleration limit ("ALR") nor does Boyer explain how the limit is obtained or calculated. It also appears that the path plan calculated by Boyer is not related to a restricted acceleration curve because Boyer mentions that optimal performance is determined when "the results of the motor performance [according to a calculated plan] are analyzed by a user and compared with known performance values" (column 5, lines 41-45).

Kato states that "the position of the point A on the time axis in Figure 4 and the maximum acceleration (a position of the point A on the axis of ordinate) in the acceleration profile (central chart) are determined" (column 7, lines 13-16). Furthermore, column 4, line 48, states that "reference character D designates a characteristic curve (torque curve) of the maximum torque of the motor". Therefore, it is clear that the solid line (actual speed-acceleration curve) of Figure 4 is far below the dotted line (predetermined speed-acceleration curve which is equivalent to a restricted acceleration curve). In Figure 4, the maximum of the solid line is a horizontal straight-line, not "lying along" approximately, etc. the dotted line D. This solid line does not allow prolonged use of the maximum torque of a motor.

In contrast, the presently claimed invention, and actual speed-acceleration curve lies along, approximately, etc. the restricted acceleration curve, which allows using the maximum torque of the motor for a prolonged period. This advantage can be achieved by changing acceleration during every accelerations/deceleration cycle.

Withdrawal of the rejection is respectfully requested.

BOYER DOES NOT DISCLOSE CURVE WHERE PREDETERMINED SPEED-ACCELERATION CURVE HAS DIFFERENT ACCELERATION MAGNITUDES FOR A GIVEN SPEED MAGNITUDE DEPENDING ON WHETHER AN AXIS IS ACCELERATING OR DECELERATING

Claim 1, for example, recites "said predetermined speed-acceleration curve has different acceleration magnitudes for a given speed magnitude depending on whether an axis is accelerating or decelerating". In other words, for one given speed, its acceleration/deceleration magnitude may depend (differ) on whether the given speed is accelerating or decelerating.

The rejection does not directly discuss this feature. However, the feature cited above appears impossible with Boyer. Boyer discloses only variations of "a single normalized function" (column 7, lines 14-16). The normalized function is the polynomial at column 6, line 61. The polynomial has various powers of Z, and Z "linearly ranges between 0 and 1" (i.e. is positive)

(column 6, line 50). Therefore, the curve of the polynomial appears to always have the same acceleration magnitude for the same speed magnitude.

CURRENT REJECTION SUBSTANTIVELY SAME AS PREVIOUS REJECTION

The rejection cites Kato as teaching "a restricted acceleration curve, where in plural speeds, there are plural corresponding acceleration or deceleration points or segments *based on* the restricted acceleration curve (Figure 4)". The rejection's paraphrasing of the actual language of the claims glosses over a distinction explicitly discussed in Applicant's previous response. In an Amendment filed January 20, 2004, claim 1, for example, was amended to recite that "for plural speeds of the speed-acceleration curve, corresponding plural predetermined accelerations of the speed-acceleration curve (or corresponding plural predetermined decelerations) are based on, or equal to, or approximations of plural corresponding accelerations (or decelerations) of a restricted acceleration curve for the corresponding axis".

At page 7 of Applicant's January 20 Amendment, with respect to the Kaneko reference, applicant remarked that "a torque curve ... is not analogous or equivalent to the restricted acceleration curve in the present claims. In general, acceleration or deceleration performance (e.g. a curve) can be determined based on friction and gravity acting on machine parts and also the torque characteristics of a motor. ... in contrast to an acceleration curve, Kaneko discloses a speed-torque curve, where a motor is controlled for performance that will lie along the speed-torque curve. The speed-torque curve of Kaneko does not allow for taking into account factors such as friction and gravity acting on the machine."

The new rejection cites Kato for teaching points on a restricted acceleration curve. However, Kato clearly states that the cited Figure 4 is a "graph showing transition of a relation between the speed and the torque from a start to an endpoint" (column 3, lines 36-38), and "the transaction of a relation between the speed and the torque from the start point to the endpoint is represented by a group as shown in FIG. 4. In this figure, reference character D designates a ... torque curve" (column 4, lines 45-50).

In citing Kato, the Office has changed only the form of the rejection and not the substance. That is, with respect to the cited-for teaching, Kato is the same as Kaneko.

Similarly, the shift to reliance on Kato in lieu of previously-cited Cheng is also an insubstantial change. Applicant previously argued (pages 7 and 8) that Cheng does not show

plural accelerations, or plural decelerations. Similarly, Figure 4 of Kato shows only one acceleration (point A), and one deceleration (point B). Claim 1, for example, recites plural accelerations or plural decelerations. Even if a restricted acceleration curve were present in the cited prior art, a curve for controlling acceleration with only a single acceleration point corresponding thereto (or deceleration point) would not realize the degree of performance gained by aspects of the presently claimed invention.

It is respectfully noted that before issuing an Office Action, an examiner is to "[review] all the evidence, including arguments and evidence responsive to any rejection, before issuing the next Office action." (MPEP § 706). Furthermore, according to MPEP 706.07, "Switching from ... from one set of references to another by the examiner in rejecting in successive actions claims of substantially the same subject matter, will alike tend to defeat attaining the goal of reaching a clearly defined issue for an early termination, i.e., either an allowance of the application or a final rejection."

It is respectfully submitted that the Office has not considered the Applicant's previous arguments regarding distinctive features of the previous and current claims. Applicant respectfully requests the Office to respond to the arguments distinguishing over a torque curve and also distinguishing over a single acceleration and/or deceleration point, or withdraw the rejection.

CLAIMS 6 AND 8: INCOMPLETE EXAMINATION, AND FEATURES NOT IN CITED ART

The rejection of claims 6 and 8 should be withdrawn because the rejection fails to clearly articulate which portions of the reference support the rejection, and therefore Applicant does not have an opportunity to respond. In other words, Applicant cannot address the rejection of claims 6 and 8 because Applicant has no way of determining what portions of Boyer or Kato are alleged to correspond to features of claims 6 and 8.

It is respectfully noted that "[t]he goal of examination is to clearly articulate any rejection early in the prosecution process so that the applicant has the opportunity to provide evidence of patentability and otherwise reply completely at the earliest opportunity" (MPEP § 706). Furthermore, "... findings should clearly articulate which portions of the reference support any rejection" (MPEP § 2144.08 (III)).

Claim 6, for example, recites "using the speed-to-acceleration mapping to map a speed of a previous cycle to an acceleration value and using the acceleration value for the given

movement cycle". Claim 8 recites "determining accelerations/decelerations for the movement command by, for each cycle in said acceleration/deceleration processing, determining each acceleration/deceleration in accordance with a speed of a previous processing cycle ".

The rejection does not explain how or where the prior art discloses these features. Boyer discusses obtaining an operational velocity (column 5, lines 39-45), however, the velocity is used after the entire move cycle is complete (robot has returned to its start position) to allow a user to analyze the performance of the calculated path plan. Boyer differs because there is no discussion of a speed of a previous cycle or its use to determine a next acceleration/deceleration, and because, according to column 5, lines 39-45, operation speed is measured during a test and later, after operation, compared to known performance values for the motor. This a significantly different use of speed during operation than that recited in claims 6 and 8. Kato was not cited as teaching the elements with the features discussed above.

Features of claims 6 and 8 have not been examined. Applicant respectfully requests either withdrawal of the rejection or a new Non-Final Office Action providing the required examination of the features in claims 6 and 8 discussed above.

DEPENDENT CLAIMS

The dependent claims are deemed patentable due at least to their dependence from allowable independent claims. These claims are also patentable due to their recitation of independently distinguishing features. For example, claim 9 recites that "the speed acceleration curve is based on a motor output torque, machine friction, and gravity." This feature is not taught or suggested by the prior art. Withdrawal of the rejection of the dependent claims is respectfully requested.

CONCLUSION

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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